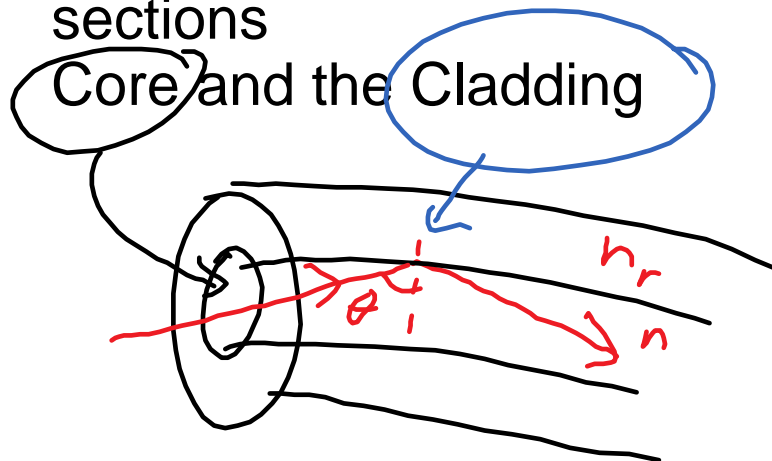


## Fibre Optics

You take a signal and change it into a series of light signals transmitted down a cable with two sections



$$\theta > \theta_c = \sin^{-1}\left(\frac{n_r}{n_i}\right)$$

↑  
critical angle

Why bother?

advantages of fibre optics over sending an electric signal down a wire?

Electric resistance dissipates energy as heat.  
Fibre optic cables lose very little energy,

Quantify the energy lost as attenuation.

Power lost (in dB) =  $10 \log P_f/P_i$   
(you can use the same equation for gain in an amplifier)

Other advantages of fibre optics - no electrical

interference.

greater bandwidth

security from tapping the signal.

HL topics

Xrays also lose energy passing through materials, this is how you get X-ray images.

$$I = 10 \log I_1/I_0$$

it decreases exponentially.

$$I = I_0 e^{-\mu x}$$

$$\mu = \ln 2 / x_{1/2}$$

$x_{1/2}$  is the distance where you lose half of the intensity of the X-ray.

$x$  is the distance in the tissue - for medical diagnosis.

Handout-

p34 Q42, 44, 50, 56, 58

p43 Q 63, 67, 69, 73, 78

